

Space Radiation Shielding Technology Workshop

Reid Conference Center
NASA Langley Research Center
April 3-5, 2002

April 3

8:00 Registration
9:00 Welcome (Delma Freeman)
9:10 Workshop Overview (John Wilson)

I. Basic Radiation Protection and Engineering Methods

Chair: Richard Fullerton
Co-Chair: Christopher Sandridge

moved Relevance of Radiation Protection to NASA Missions (Michael Wargo)
9:20 Radiation environments and environmental models (Michael Xapsos)
9:40 Risks of late effects from space radiations: Uncertainty reduction and mitigation (Francis Cucinotta)
10:00 RADATA – Radiation Test Database (Sammy A. Kayali)
10:20 On using commercial off the shelf (COTS) electronic products in space (William Culpepper)
10:35 Role of shielding materials (John Wilson)
moved Space Radiation Shielding Technology in Advanced Engineering Environments (Ahmed Noor)

Poster A new system of radiation protection based on a 1967 NCRP document? (Michael Waligorski)

II. Preliminary Considerations and Concepts

Chair: Walter Schimmerling
Co-Chair: James Adams

10:50 Mission strategies and Orbital Aggregation & Space Infrastructure Systems (OASIS) (Patrick Troutman)
11:10 Propulsion and radiation protection (L. Dudinski)
11:30 Improved spacesuit fabric and structural components (Joann Ware)
11:45 Radiation Shielding Effects of Integrating Life Support and Task Performance Systems With the Extra-Vehicular Mobility Unit (Edward Hodgson)

Lunch 12:00-1:00

1:00 What's NEXT for EVA (Richard Fullerton)
1:20 CAD Model Analyses of Shuttle Spacesuit Radiation Exposures for Multiple Environments (Brooke Anderson)
1:35 Exploration surface systems (William Cirillo)

- 1:55 Radiation shielding models and related software (Garry Qualls)
2:15 An approach to the development of mass distribution and composite models for spaceflight operational radiological risk analysis using CAD software (Neal Zapp)
2:35 Radiation shielding produced by mini-magnetospheres (R. Winglee)

Poster Gateway shield model development (Brooke Anderson)

III. Multidisciplinary Design Methods

Chair: Francis A. Cucinotta

Co-Chair: Giovanni de Angelis

Break 2:50-3:00

- 3:00 Integrating Disciplinary Information and Data in Support of Design of Multidisciplinary Systems. (J. Sobieski)
moved Environment for Launch Vehicle Integrated Synthesis (ELVIS) (John Korte)
3:20 ELVIS MDO Radiation Constraints (John Wilson)
3:35 A multifunctional radiation protectant structural concept (Ed Glaessgen)
3:50 Regolith materials for Martian structures (Sheila A. Theibeault)
4:00 NEXTGRADE approach to multidiscipline integration (Chris Sandridge)
4:20 Optimization Procedure for Space Missions (Ram Tripathi)

Poster Lightweight Radiation Shielding Materials with Carbon Nanotube Reinforcements (R. Vaidyanathan)

Poster Space-Durable Polymers for Space Structures and Radiation Shielding (Sheila Thibeault)

IV. Reliability Design Methods

Chair: Hugh Evans

Co-Chair: Neal Zapp

- 4:40 Designing for Uncertainty; Probabilistic and Possibilistic Design methods (Jefferson Stroud)

Adjourn

Dinner 6:30

April 4

- 8:00 Design risks and optimized shielding (Ram Tripathi)
8:10 A new method for radiation shield design (John Davidson)
8:25 *Environment for Launch Vehicle Integrated Synthesis (ELVIS)

(John Korte)

V. Immersive Design and Collaborative Engineering Environments

Chair: Sammy A. Kayali

Co-Chair: Patrick Troutman

8:45 Immersive facilities capabilities for design and collaboration
(Chris Sandridge)

9:05 ISS Radiation Shielding and Acoustic Simulation Using an Immersive
Environment (Joshua VerHage)

9:25 The virtual EMU mobility visualization project (Anthony Bruins)

9:45 Synergetic Engineering Environments (Scott Angster)

Break 10:05-10:20

10:20 *Space Radiation Shielding Technology in Advanced Engineering
Environments (Ahmed Noor)

10:40 Web-based collaborative environments (Robert Singleterry)

11:00 ESA radiation shielding R&D activities (Petteri Nieminen)

11:20 *Relevance of Radiation Protection to NASA Missions (Michael Wargo)

Poster Radiation Shielding model development for the ISS Italian HAB
(Giovanni de Angelis)

Poster Updating the tools to estimate space radiation exposures for operations:
codes, models, and interfaces (Neal Zapp)

Poster The ISS 8A Configuration Radiation Shielding Model (Craig Hugger)

VI. High-Performance Computational Methods

Chair: Jaroslaw Sobeiski

Co-Chair: John Korte

11:40 Parallel computational systems and methods (Duc Nguyen)

11:55 Reconfigurable computer technology (Olaf Storaasli)

Lunch 12:10-1:00

1:00 Fast computational procedures (John Heinbockel)

1:15 Effects of isotopic dependence of nuclear fragmentation on GCR transport
problems (Francis Cucinotta)

1:30 MCNPX applications for space radiation shielding (Laurie Waters)

1:45 Progress in Monte Carlo methods based on FLUKA & ROOT (Anton Empl)

2:00 High-speed computation of non-isotropic radiation exposure in low Earth
orbit. (John Nealy)

Poster A fundamental solution of the linear Boltzmann equation (John Tweed)

Poster Advances in Shielding Code Development (John Wilson)

Poster MESTRN: A Meson-Muon Transport Code Extending HZETRN
(Steve Blattnig)

Poster LEO electron exposure: A rapid analysis algorithm (John Nealy)

Poster Immersive engineering design enhanced by high-performance computing
(Garry Qualls)

Poster Introductions 2:15-2:45

Chair: Michelle Munk

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(Michael Waligorski)

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Poster Proton-Induced Nuclear Data up to 400 MeV for Space Shielding
(Y.O. Lee)

Poster The zero-degree detector system (James Adams)

Poster Neutron shielding experiments (Richard Maurer)

Demonstrations 2:45-5:00

Collaborative engineering website; Reid Center (Robert Singleterry)

ELVIS Collaborative integration; Reid Center (John Korte)

MCNPX Code; Reid Center (Lori Waters)

Immersive Visualization Collaborative Wall; B 1268 (Garry Qualls)

Immersive Visualization Collaborative CAVE; B 1229 (Chris Sandridge)

Posters 2:45-3:45

Reid Center

Round table 2:45-5:00

Reid Center

5:00 Cash bar
Dinner 5:30 Box dinner
6:00 Presentation

NASA Space Radiation Health Strategic Plan

Walter Schimmerling

April 5

VII. Tools and Concepts Validation

Chair: Michael Xapsos
Co-Chair: Richard Wilkins

8:00 Space flight validation of design tools (Martha Clowdsley)
8:40 Phantom Torso Experiment: A short summary (William Atwell)
9:00 Monte Carlo simulation of spacecraft particle detectors to assess the true human risks (Patrick O'Neill)
9:15 DESIRE: Dose estimation by simulation of the ISS radiation environment. (P. Carlson)
9:30 The development of a space radiation shielding model of the 2001 Mars Odyssey spacecraft (William Atwell)
9:45 A Deep Space Test-bed for Radiation Shielding Studies (M. Christl)
10:00 Laboratory validation of shielding concepts (Cary Zeitlin)
10:15 Approximate Methods for LEO Cosmic Radiation Shielding Calculation (M.H. Kim)
Poster Proton-Induced Nuclear Data up to 400 MeV for Space Shielding (Y.O. Lee)
Poster The zero-degree detector system (James Adams)
Poster Neutron shielding experiments (Richard Maurer)

Break 10:30-10:45

VIII. Workshop Conclusions

10:45 Charge to the Workshop (John Wilson)

11:00-12:00 Breakout sessions

Advisors: L. C. Simonsen, F.A. Cucinotta, W. Schimmerling, J.W. Wilson

Multidisciplinary Optimization Methods

J. Korte/ G.D. Qualls

- Seamless integration
- Parametric geometry
- Trajectories and propulsion

- Constraint implementation
 - Human exposure constraints
 - Materials/electronics constraints
- Optimization procedures
- Roadmap

Immersive Simulation and Collaboration Methods

C. Sandridge/M. Munk

- Large scale simulation methods
- Multidisciplinary simulations
- Realtime simulations
- Intelligence agents
- Optimization methods
- Roadmap

Web-based Collaborative Frameworks

R. Singleterry/Sammy Kayali

- Discipline site interfaces
- Engineering design interface
- Commercial frameworks
- Optimization methods
- Roadmap

Spacesuit Shielding Improvements

Edward Hodgson /J. Ware

- Improved spacesuit materials
- Improved geometry
- Role of laboratory validation
- Role of spaceflight validation
- Roadmap

Multifunctional Materials and Subsystems

S. Thibeault/E. Glaessgen

- High efficiency shielding materials
- Multifunctional concepts
- Role of laboratory validation
- Role of spaceflight validation
- Roadmap

Lunch 12:00-1:00

1:00-3:00 Breakout sessions

3:00-3:30 Report of session breakout

3:30 Workshop wrap-up (Walter Schimmerling)